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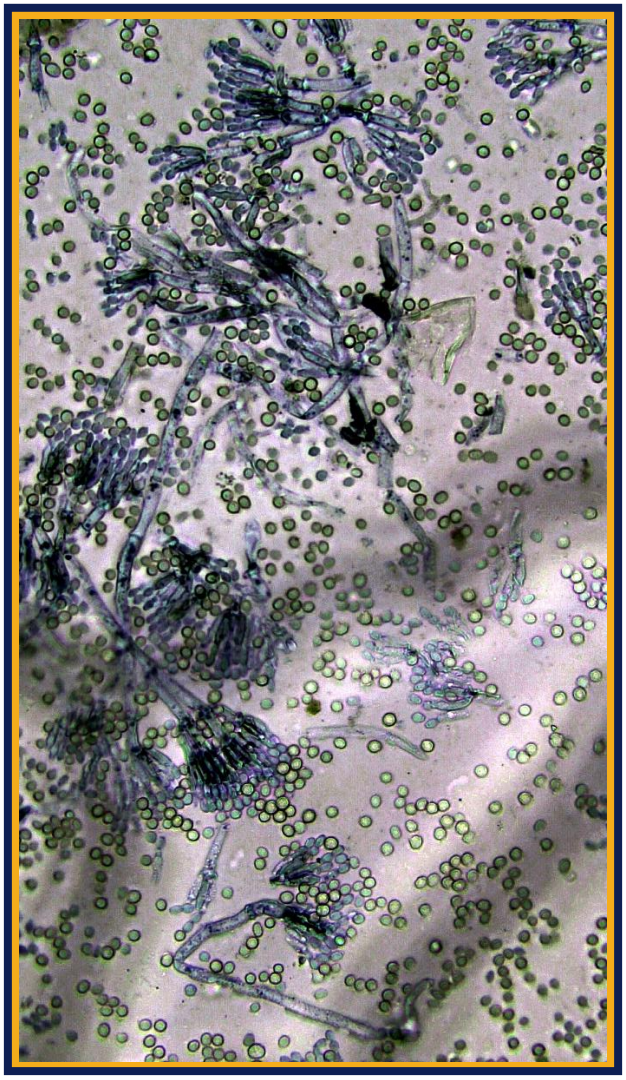
Mold Library



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Alternaria

Mitosporic (“mitosis” and “sporic”) fungus. Hyphomycetes. Anamorphic Pleosporaceae.

Characteristics

Distribution
Ubiquitous. Approx. 40-50 species.

Where Found
Soil, dead organic debris, on food stuffs and textiles. Plant pathogen, most commonly on weakened plants. It reaches peak concentrations during late summer and fall.

Mode of Dissemination
Dry spore. Wind.

Growth Indoors
On a variety of substrates and matures within 1 to 8 days. Water activity is between 0.85-0.88 (minimum for various species).

Industrial Uses
Biocontrol of weeds and other plants.

Other Comments
One of the most common fungi worldwide.

Potential Health Effects

Allergens
Commonly recognized as one of the most common mold allergens. Type I allergies (hay fever, asthma). Type III hypersensitivity pneumonitis: Woodworker's lung, Apple store hypersensitivity. May cross react with Ulocladium, Stemphylium, Phoma, others.

Potential Opportunist or Pathogen
Nasal lesions, subcutaneous lesions, nail infections; most infections reported from persons with underlying disease or in those taking immunosuppressive drugs. Most species of Alternaria do not grow at 37°C.

Potential Toxin Production
A. Alternata produces the antifungal alternariol. Other metabolites include AME (alternariol monomethylether), tenuazonic acid, and altertoxins (mutagenic).

Laboratory Notes

Growth/Culture Characteristics
Grows well on general fungal media. Colonies are dark olive green to brown, floccose to velvety (heavily sporulating). Colonies become pleomorphic over time, and lose the ability to sporulate with subsequent transfer.

Spore Trap Recognition
Distinctive. Young spores or spore fragments may be confused with Ulocladium, Pithomyces, Stemphylium, or Epicoccum. (Some Alternaria species cannot be separated from Ulocladium.)

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Ascospores

Spore category. Produced by morels, truffles, cup fungi, ergot, and many micro-fungi refers to sac-like structures known as an ascus.

Characteristics

Distribution
More than 3,000 genera.

Where Found
Saprophytes and plant pathogens. Found everywhere in nature.

Mode of Dissemination
Spores are predominantly forcibly discharged during periods of high humidity or rain.

Growth Indoors
The cellulolytic ascomycetes Chaetomium and Ascotricha are frequently found growing indoors on damp substrates.

Industrial Uses
Dependent on genus and species.

Other Comments
Some of the common asexual fungi such as Penicillium and Aspergillus produce sexual forms under certain conditions; these are classified in the ascomycete group and given distinct names. For example, the most common sexual forms of Penicillium are Talaromyces and Eupenicillium; the most common sexual forms of Aspergillus are Eurotium and Emericella.

Potential Health Effects

Allergens
Highly variable, dependent on genus and species. Poorly studied.

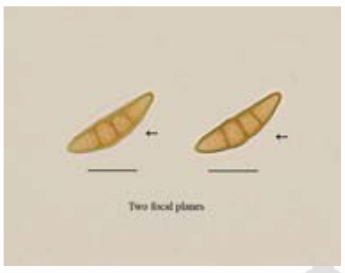
Potential Opportunist or Pathogen
Dependent on genus and species, but the vast majority do not cause disease.

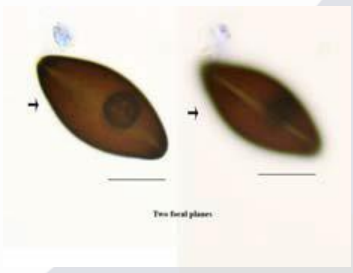
Potential Toxin Production
Very many, dependent on genus and species.

Laboratory Notes

Growth/Culture Characteristics
While some ascomycetes sporulate in culture (Chaetomium, Pleospora), many are parasitic plant pathogens, and sporulate (grow) only on living host plants.

Spore Trap Recognition
Many ascospores are distinctive. Many others will be classified as "other colorless." In general, ascospores are recognizable by the fact that they have no attachment points and are sometimes enclosed in gelatinous sheaths or within a sac.





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Aspergillus/Penicillium

Mitosporic ("mitosis" and "sporic") fungus. Hyphomycetes. Teleomorphs (sexual state): Eurotium, Neosartorya, Emericella (Ascomycetes).

Characteristics

Distribution
Ubiquitous. Approx. 200 species.

Where Found
Soil, decaying plant debris, compost piles, stored grain. Abundant and adaptive organisms that can tolerate extreme temperatures, pH levels, restricted water availability, and radiation.

Mode of Dissemination
Dry spore. Wind.

Growth Indoors
On a wide range of substrates. Water requirements range widely (dependent on species). Aw=0.71-0.94 (minimum for various species).

Industrial Uses
Many, including practical applications in food production. For example, A. oryzae is used to ferment soybeans to soy sauce. A. terreus produces mevinolin which can reduce blood cholesterol; A. niger is used in the bread and beer making industries (enzyme production) and is able to decompose plastic. A. niger and A. ochraceus are used in cortisone production.

Other Comments
Aspergillus is one of the most common fungal genera, worldwide, and Aspergillus fumigatus is one of the most common species found.

Potential Health Effects

Allergens
Common. Type I allergies (hay fever, asthma). Type III hypersensitivity pneumonitis: Humidifier lung, Malt worker's lung, Compost lung, Wood trimmer's disease, Straw hypersensitivity, Farmer's lung, Oat grain hypersensitivity, others. Other: A. fumigatus: allergic bronchopulmonary aspergillosis (ABPA), allergic fungal sinusitis.

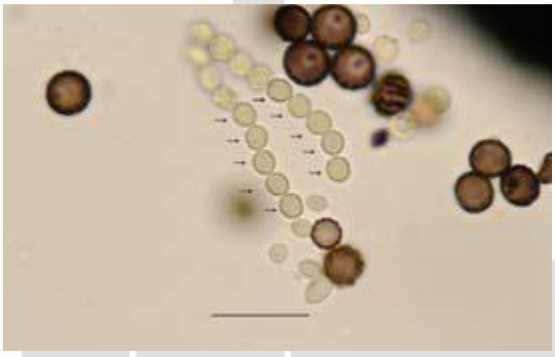
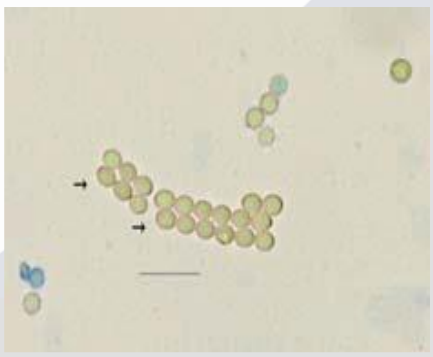
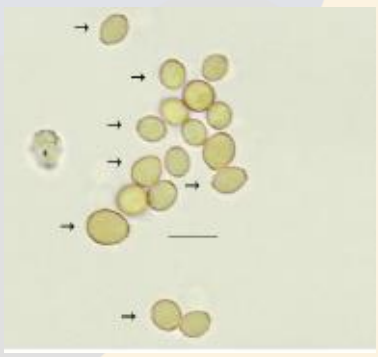
Potential Opportunist or Pathogen
Respiratory, invasive, cutaneous, ear, and corneal disease. Severe, invasive disease is usually associated with immunosuppressed hosts. Many species grow at 37°C (body temperature). A. fumigatus: fungus ball and invasive disease. A. flavus: nasal sinus lesions, invasive disease. A. niger: "Swimmer's ear," and invasive disease.

Potential Toxin Production
Partial list: A. flavus: aflatoxin B1 & B2, cyclopiazonic acid, kojic acid. A. fumigatus: ergot alkaloids, fumigaclavines, gliotoxin, fumigatoxin, fumigillin, fumitremorgens, helvolic acid, tryptoquivaline tremorgens, verruculogen. A. niger: malformin C, oxalic acid. A. ustus: austocystins. A. versicolor: aspercolorin, averufin, cyclopiazonic acid, sterigmatocystin, versicolorin.

Laboratory Notes

Growth/Culture Characteristics
Aspergillus species grow well on general fungal media. Some xerophilic species prefer dryer conditions.

Spore Trap Recognition
Free spores are indistinguishable from Penicillium, and other genera with small round to oval colorless spores. Penicillium/Aspergillus spores may have remnants of cell wall connections.

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Basidiospores

Spore category. Produced by mushrooms, puffballs, shelf fungi, rusts, smuts, and many other fungi.

Characteristics

Distribution
Approx. 1,200 genera.

Where Found
Saprophytes and plant pathogens. gardens, forests, woodlands.

Mode of Dissemination
Wind; spore release (active mechanism) during periods of high humidity or rain.

Growth Indoors
Serpula lacrimans, the agent of "dry rot," and other fungi causing white and brown wood rot, grow and destroy the structural wood of buildings. Poria incrassata causes a particularly destructive dry rot in buildings.

Industrial Uses
Many mushrooms are edible, and very important in the food industries.

Other Comments
Occasionally, a benign, non-wood rotting mushroom will fruit inside a building, growing in some unique ecological niche if enough moisture is present. If mushrooms are found growing indoors, we ask clients to submit the entire mushroom for identification.

Potential Health Effects

Allergens
Probably common. Type I allergies (hay fever, asthma). Type III hypersensitivity pneumonitis: Lycoperdonosis (puffball spores), Mushroom culture hypersensitivity.

Potential Opportunist or Pathogen
Asexual forms may cause rare opportunistic infections. The yeast Cryptococcus neoformans is a basidiomycete.

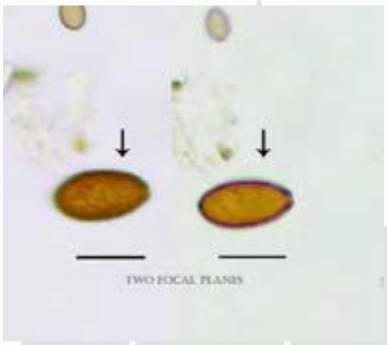
Potential Toxin Product

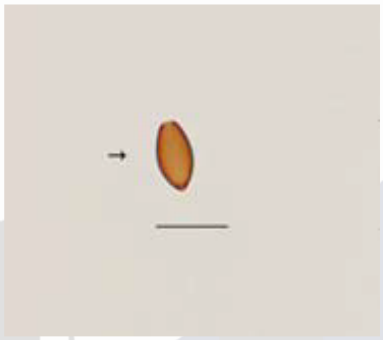
Mushroom toxicosis (poisoning) is usually a result of ingestion of the following toxins: amanitins, monomethyl-hydrazine, muscarine, ibotenic acid, psilocybin.

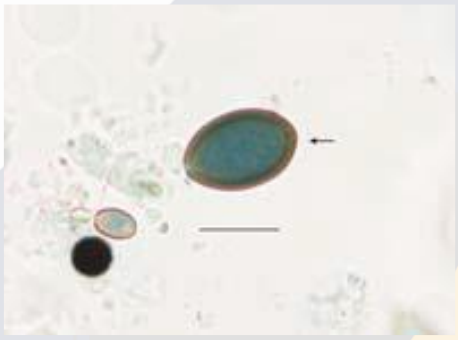
Laboratory Notes

Growth/Culture Characteristics
Most Basidiomycetes will not fruit on laboratory media. Many will form arthrosporic or sterile mycelia on laboratory media.

Spore Trap Recognition
Most basidiospores have a distinctive asymmetrical attachment point. Many basidiomycetes have recognizable spores. Serpula, the agent of dry rot, with tan-orange basidiospores, can sometimes be identified on spore trap slides.







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Chaetomium

Ascomycete.

Characteristics

Distribution
Approx. 80-150 species. Some species are thermotolerant/thermophilic and others are resistant to dry circumstances and UV radiation.

Where Found
Soil, seeds, cellulose substrates, dung, woody, and straw materials.

Mode of Dissemination
Spores are formed inside fruiting bodies. Spores are forced out an opening and spread by wind, insects, water splash.

Growth Indoors
Widespread, cellulolytic, very commonly found on damp sheetrock paper. Matures within 5 days.

Industrial Uses
Used in textile testing and the production of cellulase.

Potential Health Effects

Allergens
Not well studied. Type I and Type III allergies (hay fever, asthma), anaphylaxis, angioedema, (dermal swelling), urticarial (hives), or hypersensitivity pneumonitis and allergic sinusitis.

Potential Opportunist or Pathogen
Uncommon agent of onychomycosis (nail infection).

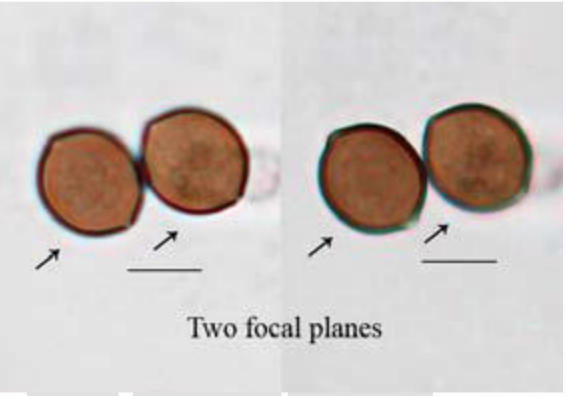
Potential Toxin Production
Chaetomin. Chaetomium globosum produces chaetoglobosins. Sterigmatocystin is produced by rare species. Other compounds produced (which may not be mycotoxins in the strict sense) include a variety of mutagens.

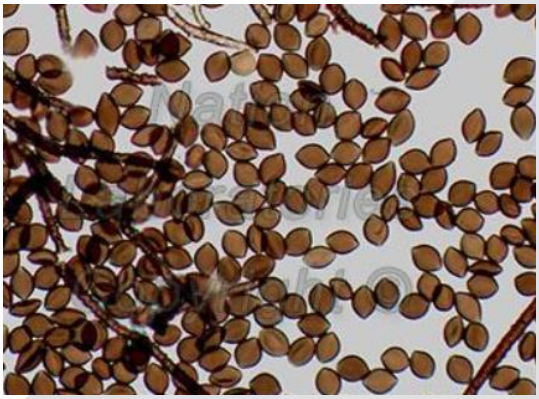
Laboratory Notes

Growth/Culture Characteristics

Grows and sporulates on general fungal media, may need 8-20 days for fruiting body production and sporulation.

Spore Trap Recognition
Distinctive. Chaetomium globous has small brown "lemon" or "football-shaped" ascospores.





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Cladosporium

Mitosporic ("mitosis" and "sporic") fungus. Hyphomycetes. Teleomorphs (sexual state): Mycosphaerella, Venturia (Ascomycetes).

Characteristics

Distribution
Approx. 28-40 species. One of the most common genera, worldwide. and identified in over 70% of homes in US and Canada.

Where Found
Soil of many different types, plant litter, plant pathogen, leaf surfaces, old or decayed plants.

Mode of Dissemination
Dry spore (formed in very fragile chains, easily dispersed). Wind. Peak spore concentrations in late spring (June and July) and early fall (September and October).

Growth Indoors
Widespread (found in over 70% of homes in US and Canada), on many substrates, including textiles, wood, moist windowsills. Grows at 0°C, and so is associated with refrigerated foods. Aw=0.85-0.88 (minimum for various species). Matures within 7 days.

Industrial Uses
C. herbarum produces enzymes which are used in the transformation of steroid intermediates such as pregnenolone and progesterone, biologically important hormones used in the industrial production of oral contraceptives.

Other Comments
G.S. deHoog & J. Guarro have placed species associated with human infection in a new genus Cladophialophora, i.e. Cladophialophora carrionii, C. bantiana. Older medical texts refer to this fungus by its formername Hormodendron species.

Potential Health Effects

Allergens
Common and important allergen. Type I allergies (hay fever, asthma). Type III hypersensitivity pneumonitis: Hot tub lung, Moldy wall hypersensitivity.

Potential Opportunist or Pathogen
Generally, non-pathogenic. One species, Cladosporium carinii, is an agent of chromoblastomycosis in subtropical and tropical regions (grows at 35-37°C).

Potential Toxin Production

Cladosporin, emodin. (Neither are highly toxic.)

Laboratory Notes

Growth/Culture Characteristics
Grows on all general fungal media. Some species sporulate better than others, and some may need cycles of light to produce spores.

Spore Trap Recognition
Distinctive, with wide variation in size and shape. Spores with dark attachment scars and some olive to brown pigmentation are identified as Cladosporium.

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Curvularia

Mitosporic fungus. Hyphomycetes. Teleomorph (sexual state): Cochliobolus (Ascomycete).

Characteristics

Distribution
More commonly found in tropical, subtropical regions. Approx. 30 species.

Where Found
Plant debris, soil, facultative plant pathogens of tropical or subtropical plants.

Mode of Dissemination
Dry spore. Wind.

Growth Indoors
Yes, on a variety of substrates.

Potential Health Effects

Allergens
Common. Type I allergies (hay fever, asthma). Other: A relatively common cause of allergic fungal sinusitis.

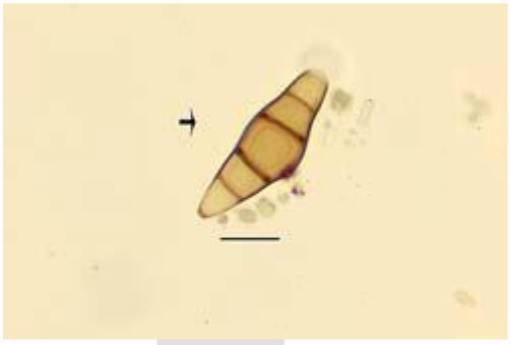
Potential Opportunist or Pathogen
Occasionally a cause of onychomycosis, ocular keratitis, sinusitis, mycetoma, pneumonia, endocarditis, cerebral abscess, and disseminated infection. Most cases are from immunocompromised patients.

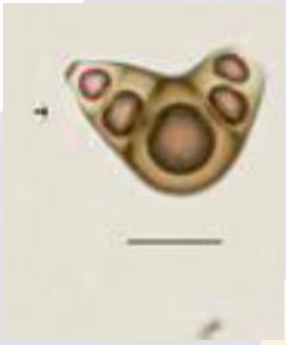
Potential Toxin Production
Not known.

Laboratory Notes

Growth/Culture Characteristics
Grows well on general fungal media; most isolates need "light/dark cycling" for sporulation. Colonies are shades of gray to brown.

Spore Trap Recognition
Distinctive; large second or center cell gives conidia pronounced curved shape. Conidia from species with less pronounced curve may be misidentified. Some Drechslera spores are similar.





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Drechslera, Bipolaris, and Exserohilum group

Mitosporic fungi. Hyphomycetes. Teleomorphs (sexual state): Pyrenophora, Cochliobolus, Setosphaeria (Ascomycetes).

Characteristics

Distribution
Some species are more commonly found in tropical or subtropical areas.
Drechslera: Approx. 20 species.
Bipolaris: Approx. 20 species.
Exserohilum: Approx. 8 species.

Where Found
Plant debris, soil. Plant pathogens of numerous plants, particularly grasses.

Mode of Dissemination
Dry spore. Wind.

Growth Indoors
Yes, on a variety of substrates.

Potential Health Effects

Allergens
Common.Type I allergies (hay fever, asthma). Other: Most commonly reported cause of allergic fungal sinusitis.

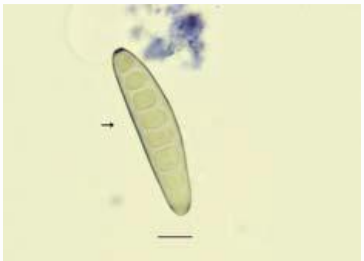
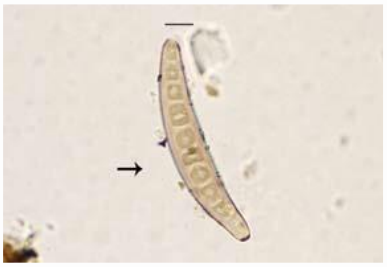
Potential Opportunist or Pathogen
Occasionally a cause of phaeohyphomycosis, including keratitis, sinusitis, and osteomyelitis. These infections most often occur in immunocompromised persons, although infections also occur in normal hosts. One case of brain abscess reported in an immunocompromised patient.

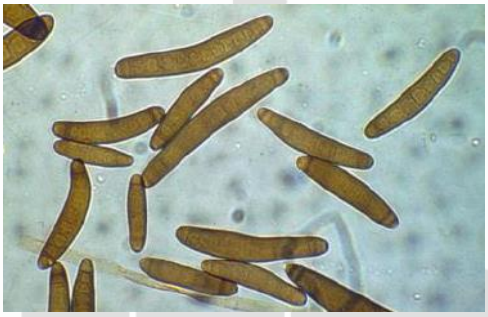
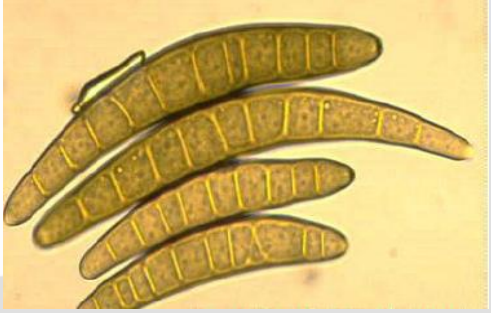
Potential Toxin Production
Not known.

Laboratory Notes

Growth/Culture Characteristics
Grows well on general fungal media although many isolates need "light/dark cycling" for sporulation. Colonies are shades of dark gray to brown.

Spore Trap Recognition
Group includes Drechslera, Bipolaris, Exserohilum and the rare Helminthosporium. Members of this group can best be differentiated in culture.

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Epicoccum

Mitosporic ("mitosis" and "sporic") fungus. Hyphomycetes.

Characteristics

Distribution
Ubiquitous; cosmopolitan. Two species.

Where Found
Plant debris, soil. Secondary invader of damaged plant tissue.

Mode of Dissemination
Dry spore. Wind. Spores also released by hygroscopic movement.

Growth Indoors
Yes, on many different substrates including paper, textiles, and insects. Aw=0.86-0.90 (minimum). Matures within 7 days.

Growth Outdoors
Epicoccum is most often found on aging or decaying plants. It is known to invade various parts of dead plants such as the seeds of corn, barley, oats, and wheat. Can also invade insects.

Potential Health Effects

Allergens
Common. Type I allergies (hay fever, asthma).

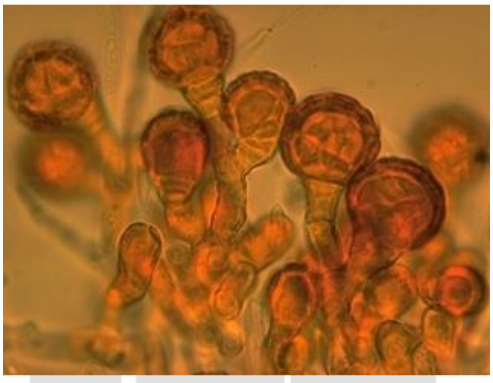
Potential Opportunist or Pathogen
Not believed to be infectious in humans or animals. Although, one reported case of fatal hematogenous mycosis in a severely immunosuppressed allogeneic hematopoietic stem cell transplant recipient possibly attributed to Epicoccum.

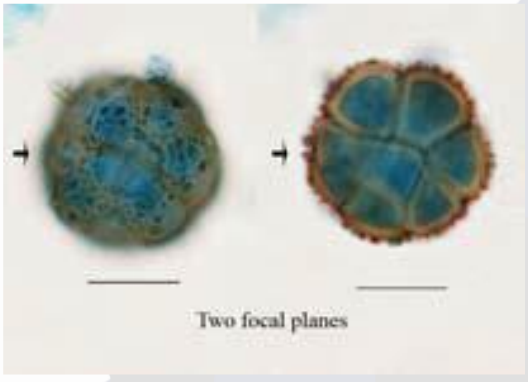
Potential Toxin Production
Antibiotic substances produced: flavipin, epicorazine A & B, indole-3-acetonitrile. Secondary metabolites and mycotoxins which may be useful as biocontrol agents against bacteria, fungi, and viruses.

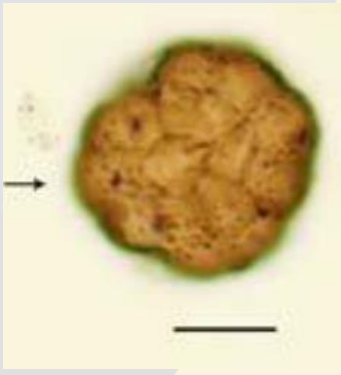
Laboratory Notes

Growth/Culture Characteristics
Grows well on general fungal media, although sporulation may be strain dependent. Colonies typically have orange reverse pigment.

Spore Trap Recognition
Intact spores are distinctive. Young spores or spore fragments may be confused with Ulocladium, Stemphylium or possibly Alternaria. Commonly found in outdoor air.







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Nigrospora

Mitosporic fungus. Hyphomycetes. Teleomorph (sexual state): Khuskia (ascomycete).

Characteristics

Distribution
Especially abundant in warm climates. Approx. 4-5 species.

Where Found
Decaying plant material and soil.

Mode of Dissemination
Active discharge mechanism. Does not require wind or rain.

Growth Indoors
Rarely found growing indoors.

Potential Health Effects

Allergens
Type I allergies (hay fever, asthma).

Potential Opportunist or Pathogen
Very rare report of human infection.

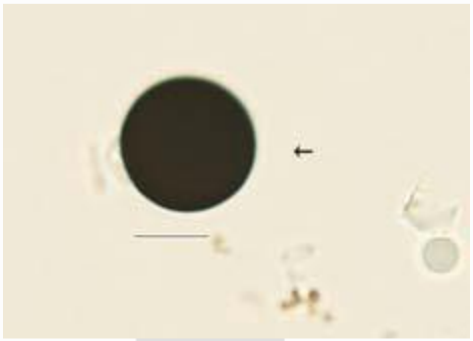
Potential Toxin Production
Not known.

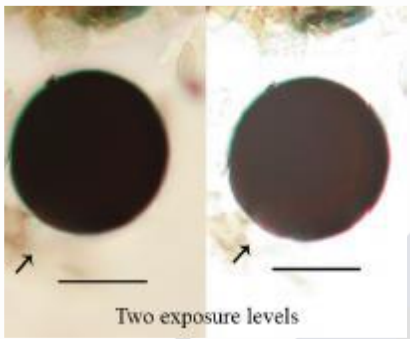
Laboratory Notes

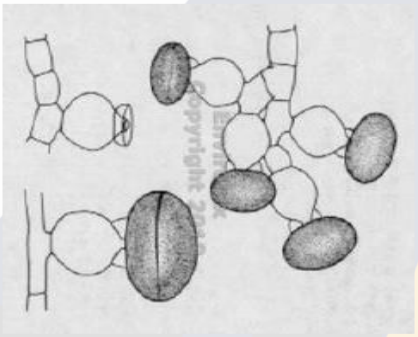
Growth/Culture Characteristics
White, floccose, spreading. Develops black spore clusters with time.

Spore Trap Recognition
A distinctive large, dark brown (nearly black), globose spore is readily identifiable on spore trap slides.

Tape Lift Recognition
Distinctive, but rarely found.







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Pithomyces, Stemphylium, and Ulocladium

Mitosporic ("mitosis" and "sporic") fungus. Hyphomycetes. Teleomorph (sexual state): Leptosphaerulina (Ascomycete) and Pleospora (Ascomycete).

Characteristics

Distribution
Pithomyces: Approx. 15 species.
Stemphylium: Approx. 6 speicies.
Ulocladium: Approx. 9 speicies.

Where Found
Common on dead leaves of more than 50 different plants, especially leaf fodders. Soil, grasses. Some species found on leaves are plant pathogens.

Mode of Dissemination
Dry spore. Wind.

Growth Indoors
Rarely found growing indoors. Can grow on paper. Spores require a high moisture content.

Industrial Uses
Not known.

Other Comments
Pithomyces chartarum is one of the causes of facial eczema in sheep in New Zealand.
Stemphylium is commonly found on plant materials (tomato, pear, cherry, pomaceous and stone fruit).

Potential Health Effects

Allergens
Known allergen. Shares allergens with Alternaria. Type I allergies (hay fever, asthma). Considered by some to be the most common mold allergens.

Potential Opportunist or Pathogen
A rare report of phaeohyphomycotic sinusitis (identification questionable).

Potential Toxin Production
Pithomyces produce Sporidesmin an organic heteropentacycilic compound.

Laboratory Notes

Growth/Culture Characteristics
Grows readily on general fungal media; sporulation may be slow and may require a "light/dark cycle." Colonies are shades of tan to brown.

Spore Trap Recognition
Distinctive multicelled, brown conidia of Pithomyces chartarum are recognizable on spore trap slides. Young spores or spore fragments may be confused with Alternaria, Pithomyces, and others, although Alternaria usually has shades of olive-green pigment.

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Smuts, Rusts, Periconia, and Myxomycetes

Fungal category. Ustilaginales. Basidiomycetes.

Characteristics

Distribution
Smuts: 2 families, 50 genera and 950 species.
Rusts: 14 families, 105 genera and 5,000 species.
Periconia: 20 species
Myxomycetes: 45 general and 500 species.

Where Found
On cereal crops, grasses, weeds, other fungi, and on other flowering plants.

Mode of Dissemination
Smuts and Rusts have both wet and dry spores. Wind disperses the Urediniospores, teliospores, basidiospores, and aeciospores. The basidiospores and aeciospores have an active spore release mechanism.

Growth Indoors
Smuts and Rusts do not usually grow indoors. They are parasitic plant pathogens that require a living host for the completion of their life cycle. Matures within 4 to 8 days.

Other Comments
Smuts are members of the Basidiomycetes and have two spore types: teliospores (dry, powdery stage) and basidiospores (yeast stage).

Rusts are members of the Basidiomycetes class. They have a complex life cycle, producing five different spore types in two different plant hosts. Spore types include: basidiospores, pycniospores, aeciospores, Urediniospores, and teliospores.

The myxomycetes have an interesting life cycle which includes a wet spore phase and a dry spore phase. When conditions are favorable, they move about like amoebae, resembling primitive animals. When conditions are not favorable, they form a resting body (sclerotium) with dry, airborne spores. The myxomycetes are not considered to be true fungi but are classified as protozoans.

Potential Health Effects

Allergens
Type I allergies (hay fever, asthma).

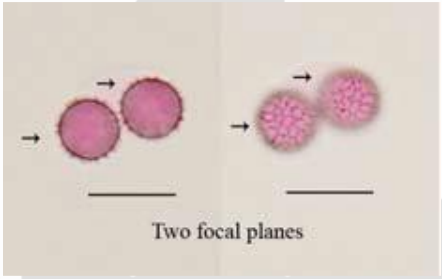
Potential Opportunist or Pathogen
No reports of human infection by the plant parasitic forms.

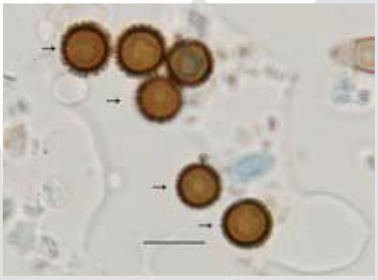
Laboratory Notes

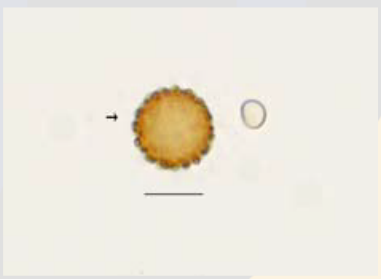
Growth/Culture Characteristics
The airborne phase (teliospores) of Smuts and Rusts require a living host for growth and will not develop on laboratory media. The yeast phase (basidiospores) is saprophytic and will grow on general fungal media.

Spore Trap Recognition
Smut teliospores cannot easily be distinguished from the myxomycetes, rusts, and certain species of Periconia. They are reported in the "round, brown" spore category: "Smuts, Periconia, myxomycetes, and Rusts."

Tape Lift Recognition
Uredospore's and teliospores are distinctive and readily identifiable on tape lifts. They may be found in dust as part of the normal influx of outdoor microbial particles.







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Stachybotrys

Mitosporic ("mitosis" and "sporic") fungus. Hyphomycetes.

Characteristics

Distribution
Approx. 15 species.

Where Found
Soil, decaying plant substrates, decomposing cellulose (hay, straw), leaf litter, and seeds. Growth not influenced by soil pH or copper; growth enhanced by manure.

Mode of Dissemination
Wet spore. Insects, water splash. Wind when dried out.

Growth Indoors
Commonly found indoors on wet materials containing cellulose, such as wallboard, jute, wicker, straw baskets, and other paper materials. (See "Characteristics: Growth/Culture"). Aw=0.94

Industrial Uses
Not known.

Other Comments
Many human reports of Stachybotrys toxicosis are anecdotal. Stachybotrys mycotoxicosis is currently the subject of toxin research.

Potential Health Effects

Allergens
Not well studied. Type I allergies reported.

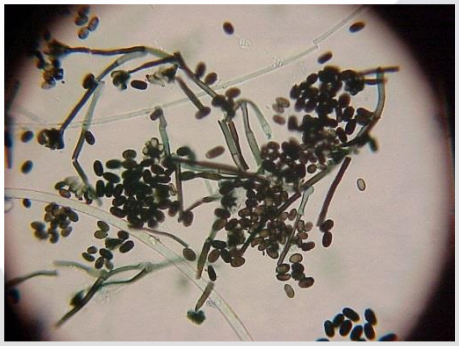
Potential Opportunist or Pathogen
No reports of human infection. (No species grow well at 37°C.)

Potential Toxin Production
Macrocyclic trichothecenes: verrucarin J, roridin E, satratoxin F, G & H, sporidesmin G, trichoverrol; cyclosporins, stachybotryolactone.Stachybotrys mycotoxicosis: human toxicosis has been described; may be characterized by dermatitis, cough, rhinitis, itching or burning sensation in mouth, throat, nasal passages and eyes. The best describedtoxicoses are from domestic animals that have eaten contaminated hay and straw or inhaled infected material from contaminated bedding.

Laboratory Notes

Growth/Culture Characteristics
Grows well on general fungal media. Stachybotrys is slow growing as compared to Penicillium and other common mold genera and may not compete well in the presence of other fungi. However, when wateravailability is high for prolonged periods on environmental material, Stachybotrys may gradually become the predominating mold, especially on cellulose containing materials.

Spore Trap Recognition
Spores of the species S. chartarum are distinctive, and not easily confused with other genera. Carbon fragments which may be oval and of similar size may sometimes be confused with S. chartarum. Memnoniella and Gliomastix produce spores with similar gray black pigment.Note: Spore trap samples are more likely to demonstrate the presence of Stachybotrys than culturable samples (Andersen).



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Torula

Mitosporic ("mitosis" and "sporic") fungus. Hyphomycetes.

Characteristics

Distribution
Found most frequently in temperate regions. Approx. 8 species.

Where Found
Soil, dead herbaceous stems, wood, grasses, sugar beet root, groundnuts, and oats. One species is thermophilic (thrives in high heat).

Mode of Dissemination
Dry spore. Wind.

Growth Indoors
Found indoors on cellulose containing materials such as jute, old sacking, wicker, straw baskets, wood, and paper.

Industrial Uses
Not known.

Other Comments
Nomenclatural problems: Torula is sometimes confused with the yeast Torulopsis. Torulosis is an old name for cryptococcosis, a disease in humans caused by the yeast Cryptococcus neoformans.

Potential Health Effects

Allergens
Type I allergies (hay fever, asthma).

Potential Opportunist or Pathogen
No reports of human infection.

Potential Toxin Production
Torula herbarium was cytotoxic in screening tests performed by our laboratory. The nature of the toxin(s) is unknown.

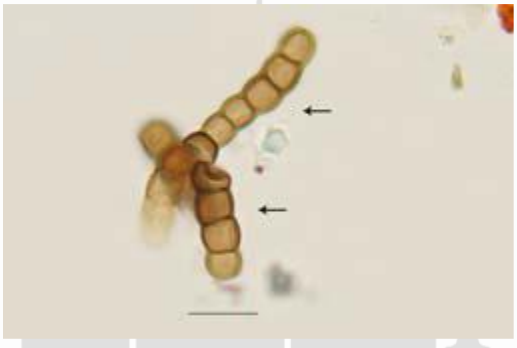
Laboratory Notes

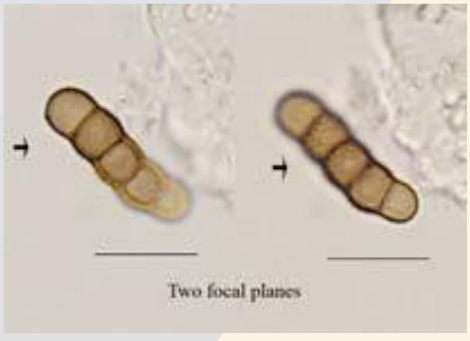
Growth/Culture Characteristics
Grows vegetatively on general fungal media but usually requires specialized media for sporulation.

Spore Trap Recognition
Distinctive, not easily confused with other genera.

Tape Lift Recognition

Distinctive, readily identifiable on tape samples.





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Trichoderma

Mitosporic ("mitosis" and "sporic") fungus. Hyphomycetes. Teleomorph (sexual state): Hypocrea (Ascomycete).

Characteristics

Distribution
Approx. 20 species. Found in northern alpine to tropical areas.

Where Found
Soil, decaying wood, grains, citrus fruit, tomatoes, sweet potatoes, paper, textiles, damp wood.

Mode of Dissemination
Wet spore. Rain, insects, water splash, and wind when dried out.

Growth Indoors
Found on paper, tapestry, wood, in kitchens on the outer surface of unglazed ceramics and on a variety of other substrates. Strongly cellulolytic.

Industrial Uses
Trichoderma harzianum pellets have been mixed with ground bark to protect trees and vegetable crops against infections from other plant pathogens. T. viride produces cellulase and hemicellulase used incommercial beer, wine and food processing. It enhances the aroma in tea and mushroom products.

Other Comments
T. harzianum has been reported to produce antifungal trichoriazines compounds.

Potential Health Effects

Allergens
Type I allergies (hay fever, asthma). Type III hypersensitivity pneumonitis.

Potential Opportunist or Pathogen
Human infections include a pulmonary cavity, peritonitis in a dialysis patient, and a perihepatic infection in a liver transplant patient. Considered an emerging opportunist in immunocompromised persons.

Potential Toxin Production
Trichothecene and cyclic peptides; gliotoxin, isocyanides, T-2 toxin, trichodermin. Trichoderma may cause a mycotoxicosis like that caused by Stachybotrys chartarum; some of the metabolic substances produced are closely related to trichothecenes.

Laboratory Notes

Growth/Culture Characteristics
Grows well on general fungal media; spreads in a white floccose mat, developing blue green to yellow-green tufts of spores. T. viride has a distinctive coconut odor (ketone metabolite).

Spore Trap Recognition
Conidia size and shape are like Penicillium and Aspergillus but Trichoderma forms sticky clumps of conidia with a distinctive green pigment rather than in chains. Typical green spore clumps are identified as Trichoderma.